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ABSTRACT

This document presents a project that attempts to increase awareness of natural resources and surface and ground water in the Miami Valley region among elementary and middle school teachers and their students. The Miami Valley (Ohio) Environmental Science Education Teacher Enhancement Project Summer Workshop involved 33 teachers investigating a combination of field-based activities, exploration of environmental curricular materials, and the development of integrated units related to water resources and environmental topics. Annual follow-ups and quarterly meetings after the workshop indicate that teachers continued to use the water resource curricular materials in their instructional practices. (YDS)

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Using Environmental Science Education Curricula and Experiences to Enhance Science Teaching for All Students: Creating an Integrated, Inclusive Learning Environment

Linda K. Ramey, Ph. D.

Introduction

The Miami Valley region of southwestern Ohio is a rapidly growing technical/industrial area with limited surface and ground water resources relative to human population and other water demands. This project was an initial attempt to involve area teachers, and ultimately their students in increased awareness of the natural resources, and surface and ground water issues in the region. The primary goal of the project was to provide elementary and middle level classroom teachers with knowledge and understanding of water-related issues and the wealth of natural resources available to them to teach environmental science education.

The Ohio Environmental Education Fund/Ohio Environmental Protection Agency funding for this project, was awarded May, 1997. Recruiting of teachers for the summer workshop commenced at that time. Thirty three teachers were selected to participate and a graduate student was hired for the project. This project demonstrated true collaboration in numerous public agencies and institutions in the Montgomery/Greene County area namely: Five Rivers MetroParks, Greene County Parks, Lower Great Miami Watershed Enhancement Program, Greene Soil and Water Conservation District, the Dayton Museum of Natural History, Montgomery

County Soil and Water Conservation, Wright State University, and several diverse public school districts as outlined herein.

Project Description

The Miami Valley Environmental Science Education Teacher Enhancement Project Summer Workshop was conducted as a combination of field-based activities and exploration of environmental curricular materials from June 19 - July 3, 1997. The two week summer institute was conducted at a variety of local natural areas depending on the day's topic of exploration. Several environmental education curricular materials were included in the training the teachers received during the summer workshop: Project Wet, Project Wild and Project Wild Aquatic, Integrating Environmental Education and Science: Using and Developing Learning Episodes, the draft version of Surface and Ground Water Resources Curriculum, and a number of site-specific brochures and materials from the various agencies involved in the workshop. Supplemental curricular materials and backpacks with kits of water testing supplies and equipment were supplied to these teachers to facilitate outdoor student investigations and have proven to be very successful on the many field trips with students. The teachers used these and other materials from their classroom curriculum to develop integrated units related to water resources and environmental topics for implementation during the school year.

Eleven resource teachers were selected to act as the on-site facilitators that work closely with the other teachers within their school(s) to build a

supportive network for the teachers during the project's year of follow up. Relevant readings and assignments were included for the resource teachers, to strengthen professional development in the area of teacher leadership skills to aid in implementation and delivery of the program. The role of these resource teachers also included assisting with collection field test data on the initial draft of the Surface and GroundWater Resources Curriculum (SGWRC) conducted during the school year. This teacher professional development model has proven to be powerful in implementing change within school settings because of its collegial nature--a fellow classroom teacher working with and supporting other teachers to bring about enhanced science teaching and learning.

Following the summer workshop, project participants met each quarter during the school year, (October 29, 1997, February 3, and April 28, 1998) to chart progress, share information, and to renew friendships developed over the course of the summer workshop. One of the most valuable, but unanticipated outcomes of the project was the collegial network that developed between the teachers from very diverse school districts, grade levels, and backgrounds. Another year-long effort was the development of the project presentation at the annual Science Education Council of Ohio (SECO) conference. This presentation took place in February and involved most of the teachers as they shared what they had done in their classrooms relating to environmental education and water/natural resources.

Classroom observations/visits were ongoing through out the year. Teacher participants have taken their students on many field trips that were closely connected to the wealth of water resources and environmental curricular materials they received and/or developed during the summer workshop. This project has directly benefited all of the 33 teachers and their students, the graduate student, and all associated with the project. More specifically, each group of teachers developed and are implementing a very specific Action Plan for integrating the newly acquired environmental science education (ESE) knowledge and teaching skills with existing classroom curriculum. The teachers' Action Plans were also based on the knowledge learned during the workshop of how various ESE curricula fulfill the requirements of the Ohio Science Model and state Proficiency Outcomes testing requirements. The teacher participants developed and shared their Action Plans for what ESE materials and experiences they would implement with their students as well as how they were going to implement their plan. These Action Plans clearly demonstrated what they had learned during the workshop and the knowledge of the curricular materials they now possessed.

Project Assessment and Outcomes

Initial data, collected on the final day of the workshop, was indicative of the overall positive tone of the two week workshop. Evaluation of the summer workshop (Figure 1), in the form of comments and an exit survey were quite favorable with near perfect scores (overall average of 4.93 on a scale of 5). The overwhelming response from the comments on the survey

forms and conversations with the teacher participants was for more opportunities to learn about environmental issues and available resources.

Figure 1.

Evaluation of the Summer OEEF Environmental Workshop

5= strongly agree, 4= agree, 3= undecided, 2= disagree, 1= strongly disagree

1. This workshop was beneficial to me as a classroom teacher.

5 4 3 2 1

Average rating = 5

2. The materials I received will be helpful in teaching about water resources.

5 4 3 2 1

Average rating = 5

3. This workshop was set up in a format that was conducive to my learning the content needed to teach about water resources/environmental education.

5 4 3 2 1

Average rating = 4.82

4. The material presented either on site or during field experiences was on an appropriate level. 5 4 3 2 1

Average rating = 4.82

5. The workshop overall was a good learning experience that I will share with other teachers. 5 4 3 2 1

Average rating = 5

6. The experiences and materials from the workshop will benefit my students. 5 4 3 2 1

Average rating = 4.96

Figure 1. (continued)

• Collective Comments:

The three best things about the workshop were:

1. Great resources, people and materials, experiences, all delivered in a teacher-friendly manner.
2. Wonderful to have the time to learn and share with other teachers with similar interests and from a variety of schools. Also time to work and coordinate all the new material with other teachers in my school.
3. A wealth of new ideas to enhance my science teaching and on how to use natural areas like the parks to help students learn about the environment.

• What I would change for the next environmental summer workshop. . .

1. Needed more time to focus on other areas of environmental education, and on other topics such as land use and development.
2. Have a naturalist to help us design and set up a land lab or natural area at our school.

Teachers' responses indicated that they saw the need for more in-depth environmental education, particularly school-based land labs that they could access more frequently and have their students involved in long term investigations. This prompted me to seek an extension of the funding period to explore issues relating to land labs and land use issues.

School visits, class observations, field trips, and other information from the 1997-98 school year indicates that the teachers continue to incorporate the water resources curricular materials in their teaching as well as to implement their Action Plans. As an indicator of the success of the

project, a principal from one of the participating schools stopped to tell me how one of the students, who is normally in trouble and in his office frequently, came bouncing into the school building one afternoon, following a field trip and water testing at the Wesleyan Nature Center, and announced that he loved doing science and that that day had been his "best day in school"! This level of student involvement and interest has been recounted several times so far this year. To me, this is exactly the type of enthusiasm that should be our goal in delivering high quality environmental education and in developing positive attitudes toward science while increasing students' conceptual understanding of the natural world.

The summative Project Survey instrument was more extensive, encompassing four categories: the summer institute, science teaching prior to the project, science teaching after to the project, and general questions related to the project. Overall responses were once again positive (Figure 2). This survey also called for the teachers to reflect on the changes that occurred in their teaching, and level of implementation of the environmental curricular materials in their classroom as well as how the program benefited their students.

Figure 2.

Miami Valley Environmental Science Education

Teacher Enhancement Project - Final Survey

Please Indicate:

5= strongly agree, 4= agree, 3= undecided, 2= disagree, 1= strongly disagree

Category 1 overall = 4.73

During the summer institute . . .

1. The facilitators were knowledgeable of subject matter being discussed. 5 4 3 2 1

Average response = 4.83

2. The facilitators were helpful. 5 4 3 2 1

Average response = 4.77

3. The materials supplied during the summer institute were appropriate and useful. 5 4 3 2 1

Average response = 4.77

4. I was supported in teaching environmental science and using the materials throughout the entire project. 5 4 3 2 1

Average response = 4.67

5. The Project Wild, Project Wild Aquatic, Project WET and other curricular materials were helpful and worth spending time on during the summer institute. 5 4 3 2 1

Average response = 4.93

6. The amount of time spent completing the institute was appropriate. 5 4 3 2 1

Average response = 4.53

Category 2 overall = 3.83

Before my involvement in this program . . .

7. I enjoyed learning and teaching science. 5 4 3 2 1

Average response = 4.20

Category 2 (cont.) overall = 3.83

Before my involvement in this program . . .

8. I spent an equal to or greater amount of time teaching science than other subjects in my classroom. 5 4 3 2 1

Average response = 3.07

9. I felt science was just as important in a child's education as math, spelling, reading, writing, etc. 5 4 3 2 1

Average response = 4.27

10. The majority of my science lessons were "hands-on".

Average response = 3.86 5 4 3 2 1

11. My students generally enjoyed learning science.

Average response = 4.24 5 4 3 2 1

12. My teaching performance in science or science-related areas was above average. 5 4 3 2 1

Average response = 3.45

Category 3 overall = 4.38

After my involvement in this program . . .

13. I enjoyed learning and teaching science. 5 4 3 2 1

Average response = 4.63

14. I spent an equal to or greater amount of time teaching science than other subjects in my classroom. 5 4 3 2 1

Average response = 3.76

15. I felt science was just as important in a child's education as math, spelling, reading, writing, etc. 5 4 3 2 1

Average response = 4.66

16. The majority of my science lessons were "hands-on".

Average response = 4.24 5 4 3 2 1

Category 3 (continued) overall = 4.38

After my involvement in this program . . .

17. My students generally enjoyed learning science.

5 4 3 2 1

Average response = 4.62

18. My teaching performance in science or science-related areas was above average.

5 4 3 2 1

Average response = 4.37

Category 4 overall = 4.73

General Questions

19. I feel as though teachers could benefit from an environmental program similar to this one. 5 4 3 2 1

Average response = 4.83

20. I would recommend this program to my colleagues. 5 4 3 2 1

Average response = 4.73

21. I have utilized the materials and the knowledge gained from this program in teaching science. 5 4 3 2 1

Average response = 4.66

22. I feel that my students have benefited from my involvement in this environmental project. 5 4 3 2 1

Average response = 4.76

23. I would complete this or a similar environmental program again if possible. 5 4 3 2 1

Average response = 4.47

24. My overall teaching performance in science or science-related topics has improved through this program.

Average response = 4.75 5 4 3 2 1

25. My overall feeling of this program is very positive.

Average response = 4.87 5 4 3 2 1

Figure 2. (continued)

Comments:

• Thanks for the opportunity to learn and work efficiently in an area I felt uncomfortable/inadequate in as a teacher. I can't wait to participate again.

• This was a great program and I highly recommend it. The contacts and resources are a valuable asset to teaching science especially on environmental issues.

• I really enjoyed the summer workshop and the SEC experience. We used many of the activities and lessons in my classroom. The students really benefited from my experience last summer.

• I have had a great time. Thank you for expanding my environmental awareness!! The facilitators were excellent teachers. Their enthusiasm toward science was contagious. I really enjoyed the opportunity to meet and work with other classroom teachers. It was great !

• [Graduate Student Tim Campbell] was an outstanding support person. Whatever he is making -- he deserves at least three times as much!

for all the assistance given to me this year from the facilitators of the Institute.

• Thanks for the extra set of hands with my classroom and students.

• Excellent program.

• Great program! Thanks for the wonderful opportunity!

• In my years of teaching, this was the most valuable, applicable project I have had the privilege of participating in! Meeting and collaborating with colleagues was a definite plus! The application of my readings of successful staff development was exemplified by the efforts of Dr. LR. She is truly a key ingredient to the success of this program. It was always organized with the students' and teachers' best interests in mind. Thanks for the opportunity.

• I already taught a lot of hands-on science. The program added to what I already did, especially in the water area. Thanks.

• My students really picked up on my enthusiasm and personal interest in our environment. WOW - the idea of running out of useable water and soil (and how long it takes to make new soil) was a "rendered speechless" concept for them.

Enhanced environmental education was evident in the amount of time and hands-on teaching of science occuring in participants classrooms. It was also reflected in more than just field trips. The teachers reported an increase in the classroom time spent on topics related to surface waters environmental science. Examples included the use of owl pellet lessons tied to habitat and food web investigations and/or building an observation "pond" environment for students to study long term at one school.

Discussion and Conclusions

The "lessons learned" can be stated quite simply: collaborate with good folks; follow sound professional development and adult education principles; set high goals but have realistic expectations for the project and participants; value and respect diversity in a broad sense; and finally, don't create what already exists, e.g. many excellent, well-tested curricular materials.

This two week workshop, with year-long follow up and quarterly meetings proved to be a successful model for helping a wide range of classroom teachers to enhance their understanding, teaching and classroom learning environment. The model was based on the Teacher Professional Model of Trainer of Trainers and grounded in Adult Learning Theory as the overall delivery framework, coupled with sound environmental education content and curricular materials. This approach enabled the project facilitators to be successful in assisting 33 classroom teachers to grow in confidence, to gain conceptual understanding, and to develop a working knowledge of ESE related to water and natural resource issues.

The teacher participants were treated as valuable members of the workshop team and their initial knowledge was the starting point for an very capable group of ESE professionals who fully understood the need to present the information, experiences, and materials in a manner that helped the teachers to feel comfortable and capable of taking some risks to extend their surface waters and natural resources knowledge base. All in all, the group still stays in close contact and during the summer of 1998, we had a three day symposia to discuss and investigate land use issues and effective design of land labs at their school sites. Our next step is a big one as Wright State University is now a GLOBE franchise site and the MVESETEP participants will be first in line to take part in this newest ESE project for classroom teachers.

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